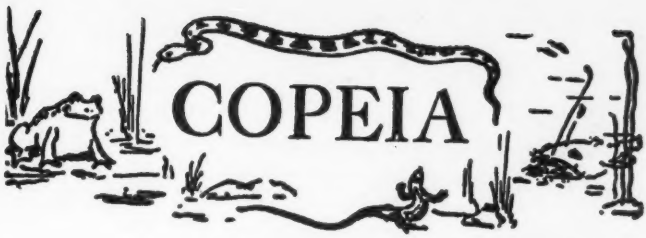

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CONTENTS OF ISSUE 167

	PAGE
Fishes of Upper South Carolina *by* A. L. PICKENS. . . .	29
Pseudogenera *by* W. HAROLD LEIGH-SHARPE	32
The Existence of Cichlid Fishes in Santo Domingo . . *By* GEORGE S. MYERS	33
The Urostyle in Larval Characin Fishes . . . . . *By* GEORGE S. MYERS	36
Pristipomotdes Miscrolepis in Hawaii . . . . . *By* HENRY W. FOWLER	37
Note on *Evolantia* Snodgrass and Heller . . . . . *By* HENRY W. FOWLER	37
Catadromous Salmon *by* MAJOR CHAPMAN GRANT . .	38
Note on *Clupea Fimbriata* Bowdich . . . . . *By* HENRY W. FOWLER	38
Note on *Safole* Jordan *by* HENRY W. FOWLER . . .	39
Cottus Recei from Alberta, Canada *by* J. R. DYMOND . .	39
Note on *Pimelodus Gambensis* Bowdich . . . . . *By* HENRY W. FOWLER	40
Note on a Two-Headed Specimen of the Pacific Garter Snake *by* EDNA M. FISHER	40
Amphibians and Reptiles of the Douglas Lake Region in Northern Michigan *by* FRANK N. BLANCHARD . .	42
Some Salamanders from Caesar's Head, South Carolina *By* E. B. CHAMBERLIN	51
Note on a Garter Snake *by* LOUIS A. ROOT	52
Exalias Obscurus Borodin, vs. *Cirripectes Alboapicalis* (Ogilby) *by* N. BORODIN	53
On the Appetite of *Amiatus Calva* (Linnaeus) . . . *By* C. M. BREDER, JR.	54

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FISHES OF UPPER SOUTH CAROLINA

To the mammalogist, the ornithologist, and the herpetologist, biological zones in the southern piedmont regions present perlpexing problems. The Austroriparian and the Alleghenian seem determined to fraternize across the Carolinian until at times one almost wonders if the Carolinian or Upper Austral zone is not broken into a series of islands in crossing Carolina. Ichthyology, less often used in the study of geographical distribution, distinctly relates upper South Carolina to the more northerly regions. The following species have been recorded from this part of the state by Aggasiz, Baird and Girard, Jordan and Brayton, and in my notes. After each species I briefly indicate the distribution in regard to the relation of the state to the eastern part of the United States, except where the species is merely introduced in South Carolina.

Lepisosteus osseus, Long-nosed Gar. General.

Salmo irideus, Rainbow trout. Introduced into South Carolina.

Salvelinus fontinalis, Brook trout. Northerly.

Anguilla chrisypa, Common eel. General.

Catostomus commersonii, Common sucker. Northerly.

Catostomus nigricans, Hog, or Black sucker. Northerly.

Minytrema melanops, Spotted sucker. Fairly general.

Erimyzon sucetta, Chub sucker. Fairly general.

Moxostoma cervinum, White mullet. Restricted range in Carolinas and Virginia.

Moxostoma papillosum, Red Horse mullet. Restricted range from Virginia to central Georgia.

Moxostoma rupiscartes, Jumping mullet. Restricted range. Carolina and Georgia.

Cyprinus carpio, Asiatic carp. Introduced.

Campostoma anomalum, Stone-roller minnow. General.

Hybognathus nuchalis, Silvery minnow. General.

Semotilus atromaculatus, Horned dace. Fairly general.
Leuciscus vandoisulus, Blue-green dace. Restricted, Chesapeake to Georgia.
Leuciscus margarita, Pearl dace. Northerly to Pennsylvania.
Abramis crysoleucas, Golden shiner. General.
Notropis hudsonius saludanus, Silver-fin shiner. Local variety of general species.
Notropis chlorocephalus, Green-headed minnow. Local.
Notropis analostanus, Lace-fin minnow. Northerly.
Notropis niveus, Snowy minnow. Restricted. Virginia and Carolinas.
Notropis pyrrhomelas, Fiery black minnow. Local.
Notropis scepticus, Big-eyed minnow. Restricted, Cape Fear to Santee.
Notopis coccogenis, Red-cheeked minnow. Restricted, Kentucky to Georgia.
Notropis galacturus, Milky-tailed minnow. Somewhat restricted in a westerly line from South Carolina to the Ozarks.
Notropis rubricroceus, Saffron minnow. Local.
Hybopsis labrosus, Thick-lipped minnow. Local.
Hybopsis hypsinotus, High-backed minnow. Local.
Hybopsis kentuckiensis, Horny River chub. Fairly general.
Hybopsis rubrifrons, Red-forehead minnow. Local. South Carolina and Georgia.
Ictalurus punctatus, Channel, or Spotted catfish. General toward Mississippi River valley.
Ameirus platycephalus, Mud catfish. Restricted, Carolinas and Georgia.
Schilbeodes insignis, Mad-tom catfish. Northerly.
Esox reticulatus, Chain pickerel. General.
Esox americanus, Banded pickerel. General.
Fundulus nottii, Star-headed minnow. Southerly.
Gambusia affinis, Larger-top minnow.

Heterandria formosa, Lesser-top minnow. Top minnows have been introduced into the upper part of the state in the mosquito campaign.

Chaenobryttus gulosus, Warmouth. General, but common in South.

Lepomis auritus, Yellow-belly sunfish. General. The variety, *L.a.solis*, a southern form, has been taken near Augusta, Ga.

Lepomis incisor, Blue-gill bream. Introduced.

Eupomotis gibbosus, Common sunfish. General, but rarer toward South.

Micropterus dolomieu, Small-mouthed black bass. Introduced.

Micropterus salmoides, Large-mouthed black bass. General.

Hadropterus peltatus, Shielded darter. Northerly to Pennsylvania.

Boleosoma nigrum maculiticeps, Johnny Darter. Local variety of northerly species.

Etheostoma thalassinum, Sea-green darter. Local.

Etheostoma flabellare. Fan-tailed darter. Fairly general distribution.

Generally distributed forms, locally distributed forms of one or two states, and restricted forms, found only in a few neighboring states make up almost the whole list of native species. Of the others all but one species and one variety are found more to the north, both the exceptions being taken near Augusta, at points near, and perhaps even below the fall line that marks the lower edge of the piedmont regions. Further up the Savannah, but from a tributary on the Georgia side, Jordan recorded *Hadropterus nigrofasciatus*, Crawl-abottom, a southern form ranging probably from South Carolina to Louisana. For a local museum in care of Prof. G. A. Buist, of Greenville, I mounted an *Ameirus nebulosus*, Horned Pout, taken by Hildebrand at Hamburg, evidently just below the fall line. This is of general distribution. *Notropis procne*, Choby,

from the Catawba, across the North Carolina border, may occur within the state at times. It ranges north to the Delaware. *Salmo levensis*, Lochleven trout, and *Salmo gairdneri*, Steelhead salmon, are merely introductions into nearby North Carolina waters. Fishermen describe an odd fish from the Saluda, which I have been unable to secure, that suggests the possible occurrence of a larval lamprey.

Taken altogether the species found make up a list distinctly related to the states to the north, and Smith's "Fishes of North Carolina" describe all the recorded species of Upper South Carolina except the local *Hybopsis rubrifrons* and the recently collected *Leuciscus margarita*. (Copeia, No. 163.) Smith's work on the fishes of the adjoining state, and Jordan and Brayton, "Fishes of the Allegheny Region," have been my chief literary sources. While lower austral land and air animals constantly invade this territory, the fishes as thus far recorded appear to make up a more homogeneous group related more consistently to their biological zone. It is possible, however, that more scientific fishing in the lower piedmont regions would reveal a greater abundance of forms related to the southern waters.

A. L. PICKENS

Greenville, S. C.

PSEUDOGENERA

In Copeia, May 1925, D. S. Jordan did me the honor to refer to my memoirs in the Journal of Morphology concerning the copulatory organs and their accessory structures in Elasmobranch fishes. He, however, wishes to "forestall discussion" by predicating that what I have called pseudogenera (*e.g.* in *Raia* and *Scyllium*) are in fact subgenera, a view which is distinctly opposed to my idea or I should never have called them differently.

It is not in my opinion reasonable that a new genus nor a subgenus, nor even a species should be erected or separated upon the differentiation of one character alone, and that one which is *confined to one sex*.

It may be as well to define in this place the term pseudogenus. Assuming that a genus is a natural assemblage of species attempting to show relationship or morphological similarity in evolution, a pseudogenus is an artificial assemblage of species (*a*) for the temporary convenience of treating a particular character or set of characters or (*b*) exhibiting a similarity which might be physiological or the result of homoplasy.

It still remains to be demonstrated what is the correlation between the form of the clasper and the vagina of the female, and it is still a problem (considering the presumedly similar habits) why there is such diversity of clasper structure in the *Raiaidae* and such uniformity in the *Trygonidae* and *Torpedinidae*.

W. Harold Leigh-Sharpe
University of London

THE EXISTENCE OF CICHLID FISHES IN SANTO DOMINGO

The fresh-water cichlid fishes form a large family, comprising over five-hundred known species grouped in eighty-eight genera. Of these, fifty-eight genera and over three hundred species are African (and Syrian), three genera and five species are Madagascan, one genus and three species are Indian, and twenty-seven genera and nearly two hundred species are Neotropical. The larger number of the African genera belong to the fauna of the great lakes, particularly Tanganyika, which contains thirty-seven genera, a large proportion of them monotypic and endemic. The majority of these are based on isolated dental

modifications of the great central genus *Haplochromis*. The American genera, though less numerous and showing less variety, nevertheless exhibit a few forms (*Symphysodon*, *Pterophyllum*) seemingly more aberrant than any in Africa.

In the West Indies, Cichlids have been reported from three islands, Cuba, Jamaica, and Barbados, but only in Cuba do we have much definite information concerning them. Pellegrin[1] has recorded the Central American *Cichlasoma octofasciatum* (Regan) from Jamaica. This record is very dubious, if not from mistaken identification, then possibly from a confusion of locality labels. Cichlids are very probably present in Jamaica, but we are in need of more specific data concerning them, as well as all the other freshwater fishes of this island. Cockerell[2] does not list any cichlids.

In Cuba the cichlid fauna is represented by one variable species belonging to the most widespread American genus, *Cichlasoma*. Dr. Eigenmann[3] split *Cichlasoma tetracanthus* (Cuvier and Valenciennes) into several races for none of which a correlated distribution can be given. Hubbs[4] has synonymized all with *C. tetracanthus*.

There is a single other West Indian record. This is *Cichlasoma adspersum* (Gunther), known only from a single large specimen said to have been taken at Barbados by Schomburgk. As Hubbs has pointed out, the apparent differences between this fish and *C. tetracanthus* are easily explained by size and age. If it is actually the same, a question immediately arises as to the locality. If *C. tetracanthus* is found in Barbados I think we might expect to find it throughout

1. Mem. Soc. Zool. France, 1904, XVI, p. 187.
2. Instit. Jamaica, Bull. No. 1, 1892. A Provisional list of the fishes of Jamaica.
3. Bull. U. S. Fish Comm., XXII, 1902 (1903), pp. 230–235.
4. Occ. Pap. Mus. Zool. Univ. Michigan, No. 90, 1920.

the Antilles and it probably can, on rare occasions, pass through the sea from island to island. Certain of the cichlids do inhabit brackish water and enter the sea. Yet if the species be able to go this far, it should have reached Trinidad and the mainland, where apparently it does not occur. For the present I choose to believe that the locality is incorrect.

Until recently there has been no inkling of the existence of cichlids in Santo Domingo or Porto Rico. In 1923 Cockerell[1] described a fossil cichlid fish from beds thought by Berry[2] to be middle or upper Miocene in Haiti. This fish, *Cichlasoma woodringi*, Cockerell places in the subgenus *Parapetenia*, close to *C. tetracanthus*, although it differs from recent species in the more anterior pelvic fins. Some variants of *C. tetracanthus* approach this slightly, however. No recent cichlids have, up to the present, been known from the island. It is thus interesting to record a living species of cichlid from the Gurabo River in the northern part of the Dominican Republic. The single specimen was shot with a .22 caliber pistol by Mr. Karl P. Schmidt, now of the Field Museum, while collecting reptiles for the American Museum. I am indebted to Mr. Schmidt for the following data.

The locality, "near Los Quemados", is shown on the sketch map of the expedition (Bull. Amer. Paleont., 5, No. 29, p. 1). It is more accurately defined as near *Gurabo adentro* of pl. XI of Vaughan's *Geol. Recon. Fomin. Rep.*, 1921. The Gurabo is not named on pl. VIII of this work, but it is the river cutting the second "V" of *Valverde* in the map. It is a tributary of the Rio Yaque del Norte. The altitude was about 500 feet, the water very clear and fairly cold and swift. The stream consisted of alternating stony riffles, rapids, and quiet stretches. It was in one of the last that the fish was shot.

1. Proc. U. S. Nat. Mus., 63, Art. 7, p. 2.
2. Proc. U. S. Nat. Mus., 1922, 62, Art. 14, p. 2.

The specimen shows no approach to the Miocene *Cichlasoma woodringi*, but is close to or identical with *C. tetracanthus* of Cuba, differing only slightly from Regan's description of that fish.[1] The pelvic fins reach the anal fin, the caudal peduncle is nearly as long as deep, and the dorsal spines increase in length to the ninth, thence slightly decrease to the last. Mr. John Tee-Van tells me Mr. William Beebe's recent Haitian expedition collected cichlids in the island, and it seems best to await study of this new material before attempting to determine whether or not the differences are of importance, and before commenting on any possible zoogeographic significance.

GEORGE S. MYERS

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California

THE UROSTYLE IN LARVAL CHARACIN FISHES

In the *Blatter fur Aquarien-und Terrarienkunde*, for February 15, 1927 (Jahrg. XXXVIII, pp. 49-51,) is an article *Uber das Auftreten einer Fettflosse bei Jungfischen von* Nannostomus anomalus *Steindachner*, by one Hermann Meinken. Herr Meinken is much concerned over what he believes is the appearance of an *adipose* fin in the larvae of a small Hemiodontid Characin fish, *Nannostomus anomalus*, which, in the adult, entirely lacks this fin. His figures of fish of 7, 9, 12, and 15 mm., however, show that what Herr Meinken has mistaken for an adipose fin is instead a most remarkably developed *urostyle*, which, in a 7 mm. (10-14 day) fish, is as long as the caudal fin. It apparently shrinks rather slowly, for in the 15 mm. (5-6 week) fish it is still represented as nearly the length of the caudal. The tip curves slightly upward and in all four figures is separated from the fin, in the

1. Ann. & Mag. Nat. Hist., (7) XVI, 1905, p. 325.

smallest for half its length and in the largest much less.

Little is known of the early development of these lower ostariophysan fishes, and although it might have been suspected that larval Characins would exhibit a well-developed urostyle, it was by no means to be postulated. The immense variety of these forms offers an untouched field to the morphologist and student of ichthyic development.

GEORGE S. MYERS

Stanford University,
California.

PRISTIPOMOIDES MICROLEPIS IN HAWAII

I reported *Aprion microlepis* (Proc. Acad. Nat. Sci. Phila., 1900, p. 502) from Hawaii on a small specimen obtained early by J. K. Townsend, which was wrongly placed with *Apsilus microdon* by Jordan and Evermann in 1905. Jordan, Evermann and Tanaka (Proc. Cal. Acad. Sci., Vol. 16, Nov. 14, 1927, p. 668, pl. 23, fig. 3) describe a specimen a little over half again as large as mine from Honolulu and name it *Arnillo auricilla*. This nominal form is surely a synonym of *Pristipomoides microlepis* Bleeker and identical in every way with my neglected record.

HENRY W. FOWLER

Acad. Nat. Sci.,
Philadelphia, Pa.

NOTE ON *EVOLANTIA* SNODGRASS AND HELLER

Evolantia Snodgrass and Heller (Proc. Wash. Acad. Sci., Vol. 5, Sept. 12, 1903, p. 189), was based on *Exocoetus micropterus* Valenciennes, on account of its short pectoral fins. Recently, on comparing some small specimens of this genotype with *Hemiexocoetus caudimaculatus* Fowler (Proc. Acad. Nat. Sci. Phila., 1901,

p. 294, fig., west coast of Mexico), though based on a young example, I found to be the same species. *Evolantia* will then give way to *Hemiexocoetus* for the short winged flying fishes.

HENRY W. FOWLER

Acad. Nat. Sci.,
Philadelphia, Pa.

CATADROMOUS SALMON

There is an indisputable record of catadromous salmon in official U. S. Government records. It happens to be in War Department records. This really makes it all the more interesting that the War Department has made such a remarkable observation in a branch of learning that we all thought far from its usual endeavors—except of course its familiarity with canned "goldfish" with which all overseas men became cloyingly familiar.

The record follows:

"Salmon, Harold G., (03955), born at sea, June 14, 1875."

Bibliography: Official Army Register, p. 523.

MAJOR CHAPMAN GRANT

Wichita, Kansas.

NOTE ON *CLUPEA FIMBRIATA* BOWDICH

The machuelo marilo of the Cape Blanco region of West Africa has usually been known since Regan's revision in 1911 as *Ethmalosa dorsalis* (Valenciennes). Regan separated it from the allied *Brevoortia* and *Ethmidium* as its greatly increased gill-rakers are triangular or T-shaped in cross section. In looking over the very crude figure and imperfect description of *Clupea fimbriata* Bowdich (Excurs. Madeira, 1825, p. 234, fig. 44, Porto Praya, San Jago Island, Cape

Verde Islands), I feel convinced that it is the same as *Alausa dorsalis* Valenciennes, which will therefore stand as *Ethmalosa fimbriata* (Bowdich).

HENRY W. FOWLER

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Philadelphia, Pa.

NOTE ON *SAFOLE* JORDAN

I proposed the name *Boulengerina* (Proc. Acad. Nat. Sci. Phila., 1906, p. 512, orthotype *Dules mato* Lesson) which Jordan later pointed out was preoccupied by the same name used by Dollo in 1886 for a genus of serpents. He then proposed *Safole* (Proc. U. S. Nat. Mus., Vol. 42, 1912, p. 655) with the orthotype *Dules taeniurus* Cuvier and including my preoccupied *Boulengerina*. However as *Moronopsis* Gill (Proc. Acad. Nat. Sci. Phila., 1862, p. 236) was founded explicitly on *Dules taeniurus* Cuvier this renders *Safole* an exact synonym and therefore entirely unnecessary. *Moronopsis* may then be used for the uniform silvery more marine species with increased gill-rakers, while those of *Kuhlia* with fewer gill-rakers are more usual in estuaries or fresh-waters.

HENRY W. FOWLER

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Philadelphia, Pa.

COTTUS RECEI FROM ALBERTA, CANADA

Among a lot of fishes sent to the Department of Biology, University of Toronto by Prof. W. Rowan of the University of Alberta was a specimen of *Cottus ricei*, taken by R. T. Rodd in the Old Man River, a tributary of the South Saskatchewan River, Alberta. This specimen which is a typical example of the species

seems to confirm Hubb's[1] contention that *C. onychus* Eigenmann and Eigenmann is synonymous with *C. ricei.*

J. R. Dymond

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University of Toronto.

NOTE ON *PIMELODUS GAMBENSIS* BOWDICH

The figure and details of this imperfectly noted fish (Excurs. Madeira, 1825, p. 234, fig. 50, Gambia), is doubtless the same as *Arius latiscutatus* Günther (Cat. Fishes Brit. Mus., Vol. 5, 1864, p. 151, fig of predorsal plate, West Africa), a species ranging from the Gambia to the Congo. While the notice by Bowdich is hardly a description, yet with the crude figure it appears to have been intended for this common shore form, which will then stand as *Tachysurus gambensis* (Bowdich).

Henry W. Fowler

Acad. Nat. Sci.,
Philadelphia, Pa.

NOTE ON A TWO-HEADED SPECIMEN OF THE PACIFIC GARTER SNAKE

A young garter snake, *Thamnophis sirtalis infernalis,* having two heads, was sent to the Museum of Vertebrate Zoölogy, University of California, in September of 1926. This specimen (M.V.Z., No. 10469) was found dead on September 4, 1926, near Santa Rosa, Sonoma County, California. The young snake was possibly not more than two or three days old when it was killed. By what means it met its death is not known.

The total length of the snake is 17 cm., the tail equalling 4.8 cm. Each head and neck to the point of

1. A check list of the Fishes of the Great Lakes and tributary waters, with Nomenclatorial notes and Analytical Keys. Univ. Mich. Mus. Zool. Misc. Pub. No. 15, 1926.

union measures 1.5 cm. The dorsal scale rows number nineteen in the anterior region and the color pattern is typical of this subspecies. There are twenty-four gastrosteges between the umbilicus and the anus.

The two heads are, of course, the chief interest, and fulfil in most points the expected duplication.

The gastrosteges of the heads are all divided into right and left parts, while those on the body are single. Also there is a difference in the number of gastrosteges on the right and left part of each neck. The left head (A) has sixteen gastrosteges on the left side, from the head to the point of union, and only ten on the right side. The right head (B) has fifteen gastrosteges on the left side from the head to the point of union and sixteen on the right side. Although the left side of A and the right side of B are duplicates, there is a noticeable lack of duplication of the two inner sides.

The labial formulae are exact counterparts of each other, and almost "normal." Head B has the supralabial formula, both right and left, of two scales anterior to the eye, two beneath the eye, and three posterior to the eye. The infralabial formula is as follows: On the right side there are four scales anterior to the eye, two below the eye, and four posterior to the eye, making a total of ten; on the left side there are three anterior to the eye, two below the eye and four posterior to the eye, making a total of nine.

Head A has the same number and arrangement of supralabials on the right side that it has on the left side; that is, two anterior to the eye, two beneath, and three posterior, totaling seven. The infralabial formula mirrors that of B. There are on the right side three scales anterior to the eye, two below the eye and four posterior to the eye, making a total of nine. On the left side there are four anterior to the eye, two below and four posterior, giving ten as the total.

Table showing labial formulae.

Head A				Head B			
Supralabials		Infralabials		Supralabials		Infralabials	
Left	Right	Left	Right	Left	Right	Left	Right
7	7	10	9	7	7	9	10

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AMPHIBIANS AND REPTILES OF THE DOUGLAS LAKE REGION IN NORTHERN MICHIGAN[1]

The first report on the amphibians and reptils of the Douglas Lake region, a list of fourteen species, was published by A. G. Ruthven in 1911.[2] In 1917 M. M. Ellis[3] published an annotated list of the species known at that time, including several additions to the earlier list. Since 1917 four species have been added to Ellis' list and numerous changes, real or conceived, have been noted in the abundance and distribution of those species reported by him. This account is for the purpose of making known these changes, summarizing the present status of each form, and setting on record numerous miscellaneous observations on the species.

Most of the collecting stations mentioned herein may be found on a map of the region published recently by Frank C. Gates[4] (1926). In this paper some account of the vegetation of the region will also be found.

Necturus maculosus (Rafinesque). Dead specimens of the mud puppy are found on the beach of Douglas

1. Contribution from the Biological station of the University of Michigan.
2. 13th Ann. Rep. Michigan Acad. Sci., p. 115.
3. 19th Ann. Rep. Michigan Acad. Sci., pp. 45–63.
4. Bot. Gaz., vol. 82, no. 2, pp. 172–173.

Lake occasionally. There is one instance of an adult found alive in perfect condition under a board on the beach at Sedge Point.

Triturus viridescens viridescens (Rafinesque). The vermillion-spotted newt breeds in the beach pools at Sedge Point. Adults may be taken from the grassy portions of these pools in the places where the larvae are found, and terrestrial subadults may be collected under wood nearby. Larvae have been taken also from the open water at the edge of Mud Lake (Aug. 7, 1923). Ellis reports the species in the lily pools of Douglas and Lancaster lakes and Bessey Creek.

Ambystoma jeffersonianum (Green). Jefferson's salamander was taken several times by Ellis, at North Fishtail Bay, and it has also been found occasionally by the writer. It has been collected a few times along the Lake Michigan beach in the northern part of Emmet County, and in 1927 was found to be common here between Cecil and Mackinaw City, on the upper part of the beach where the ground was wet. Here under boards many individuals were taken, most of which were only a year old.

Ambystoma maculatum (Shaw). The spotted salamander occurs here, perhaps commonly, but it is only rarely that specimens are seen. An adult was found by the writer in the center of a moist, thoroughly rotted log among dense, young, white birches about a hundred feet from Douglas Lake, between Bryant's and the mouth of Maple River, July 13, 1917. A year-old individual was found in a rotted log in woods near Nichol's Bog, August 8, 1924, and another of the same age was found in the Gorge, June 26, 1925.

Hemidactylium scutatum (Schlegel). The history of the discovery of the four-toed salamander in this region is of sufficient interest to be recounted in detail. In 1923 Professor Hungerford submitted to the writer for identification some salamander larvae obtained in Bryant's Bog while dipping for aquatic

insects. Identification was simple, and promptly a series of twenty-three was obtained, August 5, by industrious dipping. Later, August 17, eight more were collected. They were not found in the open water but under the edge of the overhanging leather leaf, *Chamaedaphne*. The next summer, July 8, 1924, a single year-old salamander was found by the writer after much searching, in the sphagnum a few feet from the open water of the bog. Larvae about a week to ten days old were collected at this time in the water.

On June 20, 1925, a nest of eggs nearly ready to hatch was found in this bog by Dr. Frieda Cobb Blanchard. The eggs were about five inches above water in sphagnum at the base of a small spruce tree. Two other jelly-like masses, found in appropriate situations for eggs of this species, may have been the remains of hatched eggs.

On August 3, 1926, Dr. C. W. Creaser found two adult males under trash at the edge of this bog, and on July 19, 1927, he found another adult in the same place.

On June 26, 1927, Dr. H. B. Baker found an adult male in sphagnum in Reese's Bog.

The four-toed salamander must therefore be regarded as common in the region and the scarcity of records as due to the difficulty of finding it in the sphagnaceous areas that it inhabits.

Plethodon cinereus (Green). The red-backed salamander occurs wherever there is adequate ground cover and moisture. The hardwood country is its typical habitat. It has been taken at many localities near Douglas Lake, and in the State Game Refuge in Emmet County.

A sorting of thirty-five specimens collected from Reese's Bog and the Gorge, June 24, 1925, showed three size groups, the largest of which was composed mostly of mature males. (There were no sexually

mature females in this collection.) This suggests the precedence of two years of growth before sexual maturity.

The earliest collecting date for eggs is June 19. On June 23, 1926, fifty-four individuals were collected near the mouth of Carp Creek. Most of these were in the interior of well-rotted, but not soft-rotted, logs; some were under bark or small logs. Nine of them were females with egg clusters. Apparently no sexually mature females were taken with unlaid eggs. Only one egg cluster was found unattended. The eggs numbered 6, 6, 7, 8, 8, 9, 10, 10 and 12. Most of the clusters were suspended by a jelly-like stalk from above, but one cluster of six eggs formed a ball which was stuck to the substratum by a bit of soft jelly. Several of the nests were found in a very large log which was suspended above the ground. The bark was rotted from the middle of its upper surface and soft-rotted wood with decayed leaves and vegetable debris formed the substance in which the eggs were found. Judging from the small section examined, there must have been a large number of nests in this log. All the eggs were very early stages; none were later than the gastrula.

Of the fifty-four individuals in the above collection forty-six were red-backed and only eight were black. Two other small collections in which the color was noted showed twelve red to three black-backed individuals.

Bufo americanus Holbrook. This toad is not uncommon in the moister wooded habitats and on the lake beaches. Many toads, all of this species, have been seen along the Lake Michigan shore at Cecil and Big Stone bays where they like to snuggle into the sand under driftwood.

Acris gryllus (Le Conte). The cricket frog was reported by Ellis as "very abundant in the lowland near the west side of Reese's Bog in 1913. A few speci-

mens were taken in the same locality in 1915." The cricket frog has not been found by the writer.

Pseudacris feriarum (Baird). An adult swamp tree frog was taken in perfect condition from the stomach of a small garter snake, *Thamnophis sirtalis*, collected by the writer along Trout Creek, North Fishtail Bay, in 1923.

Hyla crucifer Wied. The spring peeper is to be found occasionally in the bog forests and such places as provide protection and breeding conditions. Due to its small size and inconspicuousness it probably appears to be less abundant than it really is. Specimens have been taken in Reese's Bog, in the woods at Mud Lake and at the edge of the woods between Sedge and Roberts' points.

Hyla versicolor versicolor (Le Conte). This tree frog is fairly common. A few are seen each season on the Station grounds. Transforming young have been observed at Smith's Bog and a number of breeding males were taken in chorus after dark, June 20, 1927, by Howard K. Gloyd, at a wooded pool near Pine Point.

Rana cantabrigensis Baird. The wood frog is seen rather commonly in the bog forests and other wooded places containing suitable breeding conditions. It has been found on the beach of Douglas Lake near Maple River.

Rana catesbeiana Shaw. Of the bullfrog Ellis has the following to say: "This species was very abundant in the lily ponds and along the shaded banks of Bessey Creek in 1913. It was taken in swampy areas near Lancaster Lake, Monroe Lake and Douglas Lake, on east Maple River and in the Thuja bog on west Maple River. Two specimens were collected at Cecil, Emmet County, August 19, 1916. Large bullfrogs were less numerous each successive summer and even small bullfrogs were scarce during the summer of 1916." Nine specimens collected in 1909 are in the University

of Michigan Museum of Zoology. Six of these were collected at Vincent Lake, two at Monroe Lake and one at Douglas Lake. Three in the Museum were collected by W. E. Praeger in 1912 and one by Ellis in 1916. No bullfrogs have been found in this region in the last six years.

Rana clamitans Latreille. The green frog is found in small numbers in all suitable habitats. Ellis refers to it as common "in swampy areas adjoining Lancaster Lake, in the ox bows on Maple River, and in the vegetation near beach pools on Sedge Point."

Rana pipiens Shreber. The leopard frog is abundant in wet, grassy places near breeding sites and is sometimes to be found at considerable distances from water. It is the commonest amphibian in the region. The tadpoles transform in the latter part of July.

Eumeces fasciatus (Linné). Ellis reported finding a single specimen of the blue-tailed skink "on the sand near Burt Lake in the vicinity of the Burt Lake hardwoods July 6, 1913." The species has recently been found in the upper peninsula and doubtless thorough search would result in confirmation of Ellis's record.

Diadophis punctatus edwardsii (Merrem). The ring-neck snake must be regarded as one of the common snakes of the region. It occurs in fallen logs in wooded and semi-wooded places and under sheltering wood and bark in clearings, particularly along the Great Lakes beaches. It has been found at North Fishtail Bay, near Bryants, at Grapevine Point, in Reese's Bog, near Nichols' Bog, at Smith's Bog, near Vincent Lake and at Cecil and Big Stone bays in Emmet County. For an account of the ring-neck colony at Big Stone Bay and records of eggs collected in this region, see Langlois, T. H.,[1] "Notes on Some Michigan Snakes" and Blanchard, F. N., "Eggs and Young of

1. Pap. Michigan Acad. Sci., Arts, Letters, Vol. 4, 1924, p. 606.

the Eastern Ring-neck Snake, *Diadophis punctatus edwardsii*".[1]

Heterodon contortrix (Linné). The hog-nosed snake or spreading adder is reported by Ellis as "a fairly common throughout the region." In the University of Michigan Museum there is a specimen collected by O. J. Wenzel in 1910, one taken by A. G. Vestal in 1912 and two by N. A. Wood in 1915. One was found in 1917 and another about 1921.

Liopeltis vernalis (Harlan). The green snake is generally distributed in the grassland and more open aspen country. Several specimens are brought to the Station each summer. In 1926 eleven were found. A special study of the egg-laying habits of this species is being prepared for publication in the near future. Loveridge,[2] writing for the vicinity of Boston, Mass., remarks that a "rather peculiar thing in relation to the incidence of occurrence of green snakes at Norfolk Downs was their absence above ground from the middle of June to the end of July." At Douglas Lake, however, they are found above ground in this period as well as later in the summer, but in warm weather only.

Lampropeltis triangulum triangulum (Lacépede). The milk snake is generally distributed in the region. It has been found many times in the bog forests and in the second-growth pine and hardwood land. A small individual collected on the Station grounds in 1927 ate an egg laid by a ring-neck snake, *Diadophis punctatus edwardsii*, and a week later ate another. In the same season an adult ate two cowbird eggs. The preliminary engulfing offered some difficulty, but the egg was unbroken until about an inch back of the head. At this point it was intentionally crushed.

A female collected near Burt Lake, July 7, 1927,

1. Pap. Michigan Acad. Sci., Arts, Letters, Vol. 7, 1926, pp. 279–292, pls. 13–19.

2. Bull. Antivenin Inst. Amer., Vol. 1, No. 2, 1927, p. 58.

was dissected the next day and found to contain a complement of thirteen eggs, eight in the right oviduct and five in the left. The snake was 986 millemeters in total length with a tail 130 millemeters long. The eggs were about 17 millemeters wide and 24 to 31 millemeters long.

An adult albino milk snake was collected by Kate Kern on a road near Carp Lake, Emmet County, in 1924. It had just been killed by workmen on the road and was in perfect condition. A detailed description is given below. The colors have been recorded in accordance with Ridgway's "Color Standards and Color Nomenclature". The anterior four or five dorsal blotches are cinnamon buff, becoming gradually lighter until, on the middle and posterior portion of the body, they are pale orange yellow. The lateral blotches parallel the dorsal ones in color, but their yellowish portion is very small. Both dorsal and lateral blotches are narrowly bordered with a pale watery color. The scales between the blotches are white. Both dorsal blotches and white interspaces are marked in the median dorsal region with small flecks of pinkish. These pinkish flecks are more pronounced near and on the tail, and here the white interspaces are maize yellow. The first four white interspaces are also suffused with the latter color in their median portions. The lowest row of dorsal scales and the ends of the ventrals are more or less marked with a color close to bittersweet orange. This color also occurs on the ventral scales around the edges of what normally are the dark quadrate spots. These spots are about pale cendre green, darker anteriorly and much paler under the tail. The iris is pink; the throat and the sides and front of the head are white.

This specimen has been deposited in the University of Michigan Museum.

Thamnophis sauritus sauritus (Linné). The ribbon snake is very common although restricted in habitat.

It is found about the beach pools in North Fishtail Bay, at Sedge Point, at Smith's Bog, and typically in all places where long grass borders a lake or stream. Ellis reports it at Cecil, Emmet County.

Thamnophis sairtalis sairtalis (Linné). The garter snake is very common. It is found in all relatively open aquatic situations and occasionally in the driest places as well. It has been taken also at Cecil and Big Stone bays.

Storeria occipito-maculata (Storer). One or more specimens of the red-bellied snake are found in this region each summer. It is a secretive species of rather general distribution. It has been found in such diverse situation as under a board in a fallen house, under cedar bark close to the Lake Michigan beach, under a heavy pole, under a large stone, on the sphagnum mat of a large bog (Mud Lake), in a road, at the edge of a grass field. This species has been taken at Cecil and Big Stone bays, Emmet County, and at many localities in the vicinity of Douglas Lake. Occasionally an individual is found on the Station grounds.

Chelydra serpentina (Linné). Occasionally the snapping turtle is taken in Douglas and Burt lakes, but it is not often seen.

Emys blandingii (Holbrook). A large adult Blanding's turtle was collected August 7, 1924, among low horsetails and bullrushes in Marl Bay where the water was only an inch or two deep. At the end of the summer it was put in a bag for transportation to Ann Arbor, but the bag was lost on the Station grounds. On July 28, 1925, Miss Gertrude Grant found a large adult of this species on the hill just back of the Station's Mess. There is little doubt that this was the lost specimen. It is now preserved at the Museum in Ann Arbor.

Terrapene carolina carolina (Linné). Ellis records one specimen from the "sand west of the Burt Lake hardwoods, collected August, 1913."

Chrysemys bellii marginata (Agassiz). The painted turtle is more common than the snapping turtle although it is by no means abundant. Ellis reports finding it in "the soft sand near the edges of lily ponds", and records a deposit of three eggs on August 17, 1916.

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SOME SALAMANDERS FROM CAESAR'S HEAD, SOUTH CAROLINA

Recently, in going over some storage material in the Charleston Museum, I came across some salamanders taken at Caesar's Head, South Carolina, a few miles from the North Carolina line. This point has an altitude of about 3000 feet. The salamanders were collected by E. I. R. Jennings of Charleston, in the late summer and fall of 1912. The following species were taken:

Triturus viridescens viridescens (Rafinesque)
Plethodon glutinosus (Green)
Plethodon metcalfi Brimley
Pseudotriton ruber schencki (Brimley)
Desmognathus phoca (Matthes)
Desmognathus quadra-maculatus (Holbrook)

The only unusual find was *Plethodon metcalfi*, this being, as far as I am aware, the first specimen recorded for the state. The type locality for this species is given in Stejneger and Barbour's Check List as: "Sunburst, Haywood County, North Carolina," and the range as: "Mountains of North Carolina and Southwestern Virginia."

In July, 1927, the writer, in company with Messrs. R. H. Coleman and S. K. Johnson, of Charleston, collected some twenty-odd salamanders at Caesar's Head, getting only three species. The majority taken

proved to be *Desmognathus quadra-maculatus*, three or four were *Desmognathus fuscus carolinensis* and one *Triturus viridescens*.

For the identification of the above specimens I am indebted to Miss Doris M. Cochran of the National Museum and Dr. E. R. Dunn of Smith College.

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NOTE ON A GARTER SNAKE

I have been much interested in studying the habits of snakes during many fishing and hunting trips and witnessed a snake feeding under difficulties during the summer of 1924, the details of which may be interesting.

My wife and I had been on a trout stream in central Wisconsin all the morning with some success and by agreement met at noontime for lunch at our camp site. There was a small rivulet flowing into the trout stream at the site of our camp and I laid a board across it and cleaned some trout on the board and while returning the trout to my wife who then was preparing lunch, I had left the entrails of the trout on the board. I returned to the board within a few minutes and there, eating the entrails, was a large Yellow or "Streaked" Snake (these are local names); as a matter of fact it was a Garter Snake.

The snake saw me as I approached and scurried off through the long grass. After a few minutes search I was able to find it and picked it up and took it back to the board and placed it before its luncheon but retained a hold on its tail and much to my surprise it started to eat and paid no further attention to me. I called my wife over and she stood immediately in front of our newly made friend but this bothered it not at all. I then held its body up in the air in a horizontal position allowing it only its head and

about four inches of its neck to rest on the board in front of the food and it seemed to enjoy the repast as much under these conditions as if it had been alone and in its natural feeding haunts. After the snake had eaten its fill I carried it over to the long grass and released it and it went on its way well fed and I suppose happy.

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EXALIAS OBSCURUS BORODIN, VS. *CIRRIPECTES ALBOAPICALIS* (OGILBY)

Dr. H. W. Fowler in a note on *Exalias obscurus* Borodin expresses the opinion that it is a synonym of *Cirripectes alboapicalis* (Ogilby), Copeia, Oct.-Dec., 1927, p. 91-92).

I am greatly obliged to Dr. Fowler for his reference to certain papers which I overlooked. I have endeavored to compare thoroughly the characteristics of both these mentioned fishes, and here are the results:

Exalias obscurus Borodin from Hawaiian Islands differs from *Cirripectes alboapicalis* (Ogilby) from Lord Howe Island and the New Hebrides in having: deeper body (3 and not $3\frac{3}{4}$), head shorter ($4\frac{1}{2}$ and not 3 7-10) and higher (equal and not 5-6 of its length), roundish blunt beak-shaped snout (not subvertical), smaller eyes ($4\frac{1}{4}$ and not 3 in head).

Comparing the drawings of these two fishes (Amer. Mus. Novit., No. 281, Sept., 1927; and Rec. of the Austr. Mus., v. XII, 1917, 21), one might see that they differ considerably in general outlines of the body, in the form of the head and in the position of the mouth; the lateral line which is very conspicuous and of a peculiar form with *Exalias obscurus* Bor. is not shown on the drawing of *Cirripectes albiapicalis* (Ogilby), neither is mentioned in his and McCulloch and McNeill's description. And at last, but not the

least, the coloration of *E. obscurus* is as different from *C. albiapicalis* as black differs from white.

Having all this in view I think it is best to recognize the new species described by me under the name *Exalias obscurus*. The generic name *Cirripectes* Swainson certainly has priority over *Exalias* Jordan, if available; but its availability is doubtful. I should like to use *Cirripectes* because it indicates a most conspicuous characteristic of these fishes—a peculiar collar of cirri on the nape.

N. BORODIN

ON THE APPETITE OF *AMIATUS CALVA* (LINNAEUS)

In a recent paper Hilderand and Towers[1] state the following concerning *Amiatus calva* (Linnaeus).

"An examination of the intestinal contents of several specimens indicated the grindle to be a light feeder; and, being sluggish, it seems probable that it consumes less than a game fish of equal size. Although its general appearance suggests a voracious appetite, fish of fair size, or up to 450 mm. (17¾ inches), were found to have utilized mostly insects ordinarily found near the surface; among which were the water boatmen (*Corixa*), dragon fly-nymphs, and the whirligig beetle were the most frequent. The small shrimp (*Palæmonetes exilipes*) also appears to be taken frequently, and an appreciable amount of vegetation usually was present with the other material. The grindle attains a considerably greater length, however, than 450 mm., and the larger fish probably require a more substantial diet. One specimen of 770 mm. (30¾ inches) had swallowed a fish 8 inches in length."

At the New York Aquarium we know *Amiatus* as

1. Hildebrand, S. F. and Towers, I. L. "1928 Annotated List of Fishes Collected in the Vicinity of Greenwood, Miss., with Descriptions of Three New Species." Bull. U. S. Bur. of Fish. Vol. XVIII, Part II. Document No. 1927.

anything but a light feeder. Our specimens, of from about 300 mm. to about 600 mm., some of which have lived here since 1903[1] are among the most perpetually hungry fishes we have, except when the water drops below 64° Fahr. They then suspend nearly all activity and remain in a fairly quiescent state until it again climbs to that point. However, with the temperature over 64° they become voracious in the extreme and we consequently have little accurate knowledge of just how much it would take to completely satiate them. Ordinarily they are fed on pieces of beef heart, herring and clam or dead *Fundulus* (the last two items relatively infrequently). The point of interest, however, in the present connection is not so much their huge appetites, but rather the fact that there is such a relatively large amount of matter voided that is undigested, or at the most, very slightly digested. This is naturally more evident when tough fibrous and fatty parts of beef heart have been fed, but the effect is not greatly reduced when less resistant parts are fed. This was demonstrated experimentally by feeding clam and then following it with beef heart. The next morning the tank was full of the firmer parts of the readily broken down clam tissue. That it is not a case of regurgitation is evident by the fact that large pieces are frequently to be seen hanging from the vents of these fishes. The interpretation would seem to be that, given the opportunity, *Amiatus* will gorge itself to the point of mechanically forcing the food through its digestive tract at a speed too great for complete utilization. Realizing the slow peristalisis of fishes generally, this seems to be the only tenable explanation. As a consequence of these observations, partly from the standpoint of the fishs' health and partly from practical reasons we avoid feeding such amounts. The practical reasons are if over fed in this manner

1. See "The New York Aquarium Report for the year 1927." C. M. Breder, Jr., 1928.

they so foul their tank that it is an extremely unpleasant sight. It is noteworthy that they pay little attention to the nearly intact pieces of food that have passed through their fellows. When not fed to this extreme these same specimens pass the typically scanty and relatively unobjectionable fish stool.

This is not intended as a criticism of the Hildebrand and Towers statement but rather suggests that the fishes which they examined were scanty feeders, possibly for force of circumstances. It is one thing for fishes to have to forage for their usually active prey and another for them to have their food literally handed to them in surroundings fraught with few distracting elements. We have not noticed any particular difference in the feeding habits between the largest and smallest specimens and are led to suspect that the differences noted in the paper referred to are more mechanical than otherise, *i.e.*, the smaller the fish, the smaller the food object it would notice, on the average. Also the vegetable matter taken from the wild specimens we suspect to be rather accidental than otherwise, due likely to the frequency with which the food organisms are taken as they rush for the cover of the aquatic growths. Although both large and small specimens have been kept with aquatic plants and offered others they showed no disposition to feed on them. Furthermore such behavior would certainly not be looked for in fishes of this type.

C. M. Breder, Jr.

New York Aquarium

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